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MINISTRY OF FORESTS

Tree Farm Licence 14

Issued to Tembec Industries Inc.

Rationale for Allowable Annual Cut (AAC) Determination

Effective
March 28, 2001

Ken Baker
Deputy Chief Forester

BRITISH COLUMBIA

NEWS RELEASE

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Chief Forester's Office

NEW ALLOWABLE ANNUAL CUT SET FOR TREE FARM LICENCE 14

VICTORIA – The allowable annual cut for Tree Farm Licence 14 in the Invermere forest district has been reduced by two per cent, B.C. deputy chief forester Ken Baker announced today.

Effective today, the allowable annual cut is 160,000 cubic metres, down 4,000 cubic metres from the level of 164,000 cubic metres set in 1996. The licence, held by Tembec Industries Inc., covers more than 150,000 hectares in the Purcell Range southwest of Golden.

"This reduction is part of a managed transition to reduce the allowable annual cut gradually to the projected lower mid-term harvest level of 150,000 cubic metres per year," Baker said.

Since the last timber supply review, changes in forest management policy for Tree Farm Licence 14 have been implemented to reflect the Forest Practices Code and to anticipate the Kootenay-Boundary higher level plan order.

The determination takes into account factors like biodiversity; protection of stream, lake and wetland areas; scenic areas; and important wildlife habitat for elk and grizzly bear. Social and economic implications of possible changes to the allowable annual cut are also considered in the determination.

This allowable annual cut decision is the 16th of 34 allowable annual cuts to be determined for tree farm licences as part of the second round of the timber supply review. The forest service is also conducting a review of the 37 timber supply areas in the province.

The deputy chief forester's reasons for the Tree Farm Licence 14 determination are outlined in a rationale statement issued today. Copies are available at the Ministry of Forests Web site at http://www.for.gov.bc.ca/tsb and at the following Forest Service offices:

- Invermere forest district 250-342-4200
- Nelson forest region 250-354-6203

For more information on the timber supply review, visit our Web site at http://www.for.gov.bc.ca/tsb on the Internet.

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Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed in making a determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for Tree Farm Licence (TFL) 14. This document also identifies where new or better information is needed for incorporation into future determinations.

Description of the TFL

TFL 14 is located in the Purcell Range, about 32 kilometres southwest of Golden in the East Kootenays. It encompasses the watersheds of the Spillimacheen River and Bobbie Burns and Vowell Creeks, as well as the benches directly west of the Columbia River. TFL 14 is bounded to the northwest by Glacier National Park and to the south by Bugaboo Provincial Park.

The TFL has been held by Tembec Industries Inc. since September 29, 2000. The community of Parson, where the licensee maintains an area office, is the local base of TFL operations. The nearest larger communities are Golden and Invermere, while south of Parson are the communities of Harrogate, Spillimacheen, Brisco, Edgewater and Radium. The TFL is bounded to the southeast by the Invermere Timber Supply Area (TSA), to the southwest by the Kootenay Lakes TSA, and to the north by the Golden TSA. TFL 14 is located within the British Columbia Forest Service (BCFS) Nelson Forest Region and is administered by the Invermere Forest District office in Invermere. TFL 14 is within the asserted traditional territory of the Ktunaxa Kinbasket First Nation.

The diversity of topography, climate, and soils is reflected in the forest vegetation found within the TFL and is described by four biogeoclimatic zones: Interior Douglas-fir (IDF), Interior Cedar-Hemlock (ICH), Montane Spruce (MS), and Engelmann Spruce-Subalpine Fir (ESSF). The broad variety of habitat types support many species, including large mammals such as elk, mule deer, white-tailed deer, moose, black and grizzly bear, mountain goat, as well as numerous small mammals. According to the licensee, approximately 150 species of birds are known to use the TFL area. The main commercial timber species are lodgepole pine, Engelmann spruce, subalpine fir (balsam), and interior Douglas-fir.

Road access is provided by highway 95 that serves the east Kootenay region between Golden and Cranbrook. Forestry, mining, and ranching are the principal forms of employment and economic activity for the region although tourism is becoming increasingly important.

History of the AAC

TFL 14, originally known as Forest Management Licence 14, was awarded in 1953 to Cranbrook Sawmills Limited. At that time, the licence area was 95 903 hectares and the company was authorized to harvest 67 961 cubic metres per year. In 1961, the TFL was assigned to Crestbrook Timber Limited, whose name was changed in 1967 to Crestbrook

Forest Industries Limited (Crestbrook). By 1968, the licence area had been increased to 124 380 hectares, and with an updated inventory, improved utilization standards, and expanded harvesting land base, the AAC was increased to 111 852 cubic metres.

The chart area of Forest Licence A18978—referred to as the extension area—was added to the TFL in 1990, further expanding the land base to 161 109 hectares. At the same time, an area for the Small Business Forest Enterprise Program (SBFEP) was removed from the TFL thereby reducing the AAC allotment for the SBFEP on TFL 14 to zero. In 1995, a 10 930 hectare area, known as Bugaboo Provincial Park, was established on the TFL. When the new park area is ultimately deleted from the TFL, it will have the effect of reducing the total land base to 150 179 hectares. On September 29, 2000, Crestbrook Forest Industries Ltd. and Tembec Industries Inc. amalgamated to form Tembec Industries Inc., which is a wholly-owned subsidiary of Tembec Inc. In accordance with the Forest Act, acquisition of Crestbrook by Tembec Industries Inc. triggered a 5 percent reduction in the Crown portion of the TFL 14 AAC available to the licensee. However, due to the licensee's approved Job Creation Plan, the reduction was returned to the licensee's portion of the TFL 14 AAC.

The AAC for TFL 14 was determined in December, 1996 to be 164 000 cubic metres, which represented an 8 percent reduction from the previous AAC of 178 926 cubic metres.

New AAC Determination

Effective March 28, 2001, the new AAC for TFL 14, including Schedule A private lands, will be 160 000 cubic metres. This AAC will remain in effect until a new AAC is determined, which must take place within five years of the present determination.

Information Sources Used in the AAC Determination

Information considered in determining the AAC for TFL 14 includes the following:

- *Statement of Management Objectives, Options and Procedures (SMOOP) for draft Management Plan No. 8*, TFL 14, accepted April 27, 1999;
- *Timber Supply Analysis Information Package: TFL 14*, Management Plan No. 8, Crestbrook Forest Industries Ltd. (now known as Tembec Industries Inc.), accepted January 31, 2000;
- *Timber Supply Analysis Report: TFL 14*, Management Plan No. 8, Crestbrook Forest Industries Ltd. (now known as Tembec Industries Inc.), amended August 14, 2000 and accepted August 31, 2000;
- *Management Plan No. 8: TFL 14*, Crestbrook Forest Industries Ltd. (now known as Tembec Industries Inc.), approved November 20, 2000;
- Technical information provided through a meeting between the deputy chief forester, BCFS staff, Tembec Industries Inc. staff, and Timberline staff on August 14, 2000;
- *TFL 14, Twenty-Year Plan*, accepted July 19, 2000;

- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS and BC Environment staff including the AAC determination meeting held in Victoria on August 23, 2000;
- *TFL 14 Management Plan No. 8, Inventory Audit and Adjustment Strategy*, dated April, 1999 (prepared by Timberline Forest Inventory Consultants);
- *TFL 14 Management Plan No. 8, Ecologically Based Productivity Estimates*, dated September, 1999 (prepared by Timberline Forest Inventory Consultants);
- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives;
- Memorandum from the Minister of Forests to the Chief Forester dated February 26, 1996 stating the Crown's economic and social objectives regarding visual resources;
- *East Kootenay Land-use Plan*, Government of B.C., March 1995;
- *Kootenay/Boundary Land Use Plan Implementation Strategy*, Kootenay Inter-Agency Management Committee, June 1997;
- *Kootenay-Boundary Higher Level Plan Order, Final*, December, 2000;
- *Forest Practices Code of British Columbia Act*, July 1995;
- *Forest Practices Code of British Columbia Act Regulations and Amendments*, April 1995;
- *Forest Practices Code of British Columbia Guidebooks*, BCFS and MELP;
- *Forest Practices Code Timber Supply Analysis*, BCFS and MELP, February 1996;
- *Identified Wildlife Management Strategy*, February 1999;
- *Landscape Unit Planning Guide*, BCFS and MELP, March 1999;
- *Higher Level Plans: Policy and Procedures*, BCFS and MELP, December, 1996.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as the rate of timber growth and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the social, cultural, and economic factors that are relevant when making forest

management decisions. Therefore, technical information and analysis do not necessarily provide complete answers or solutions to forest management problems such as AAC determinations. The information does; however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

In making the AAC determination for TFL 14, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory Framework

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining AACs for TSAs and TFLs. Section 8 is reproduced in full as Appendix 1.

In accordance with Section 23 (3) of the *Interpretation Act*, the deputy chief forester is expressly authorized to carry out the functions of the chief forester, which include those required under Section 8 of the *Forest Act.*

The chief forester has expressed the importance of consistency of judgement in making AAC determinations. I also recognize the need for consistency of approach. I have observed the chief forester during a number of previous AAC determinations and am familiar with the guiding principles that the chief forester has employed in making AAC determinations. I find these principles to be reasonable and appropriate and I have employed them as described below in making my AAC determination for TFL 14.

Guiding Principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. When a large number of determinations are made for many forest management units over extended periods of time, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainty. To make his approach in these matters explicit, the chief forester has compiled a set of guiding principles for AAC determinations which I have reviewed, adopted and applied as deputy chief forester in AAC determination for TFLs. These principles are set out below. If in some specific circumstance it may be necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

(i) minimizing risk, in respect of which, in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic, and environmental risks associated with a range of possible AACs; and

(ii) redetermining AACs frequently, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to

redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires the chief forester to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or to factors that could work to reduce the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the *Forest Practices Code of British Columbia Act* and its associated regulations (the Forest Practices Code).

The *Forest Practices Code of British Columbia Regulations* were approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

Although the Forest Practices Code has been fully implemented since the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination the chief forester takes this uncertainty into account to the extent possible in the context of the best available information. In making my determination for TFL 14, as deputy chief forester, I have followed the same approach.

As British Columbia progresses toward completion of strategic land use plans, the eventual timber supply impacts associated with the land-use decisions resulting from the various planning processes—including the Commission on Resources and Environment (CORE) process for regional plans, the Protected Areas Strategy (PAS), and the Land and Resource Management Planning (LRMP) process—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be the position of the chief forester that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions not yet taken by government; except to the extent proposed strategies reflect already established, approved management practices. Like the chief forester, I will therefore not account for possible impacts of existing or anticipated recommendations made by such planning processes, nor attempt to anticipate any action the government could take in response to such recommendations, if their acceptance would significantly alter current practices.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use

decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

However, where specific protected areas have been designated by legislation or by order in council, these areas are no longer considered to be part of the timber harvesting land base or to contribute to the timber supply in AAC determinations.

For TFL 14, government's approval of the Kootenay-Boundary Land Use Plan (KBLUP) in 1995, and decisions on protected areas have clarified many aspects of land and resource use and management. The Kootenay-Boundary Higher Level Plan Order (Kootenay-Boundary HLP Order) was promulgated by Ministers on December 22, 2000. The implementation of this Higher Level Plan Order will provide further certainty regarding resource management in the area (see Kootenay-Boundary Land Use Plan).

Forest Renewal BC (FRBC) funds a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long term. As with all components of an AAC determination, I require sound evidence before accounting for the effects of intensive silviculture on possible timber supply. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as relevant scientific, empirical, and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine many outdated AACs between 1992 and 1996. In any case, the data and models available today are improved from those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, AACs should be reduced immediately in the interest of caution. However, any AAC determination made by the chief forester or myself must be the result of applying individual judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I have made allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from recent court decisions including those in the Supreme Court of Canada. The AAC that I have determined should not in any way be construed as limiting those obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within TFL 14.

With respect to future treaty decisions, as with other land-use decisions it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from decisions that have not yet been taken by government.

Overall, in making this AAC determination as the deputy chief forester, I am mindful of the chief forester's obligation as steward of the forest land of British Columbia, of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of the chief forester's responsibilities under the *Forest Practices Code of British Columbia Act*.

The role of the base case

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me by the licensee as part of the British Columbia Forest Service (BCFS) Timber Supply Review program for TSAs and TFLs.

For each AAC determination a timber supply analysis is carried out using an information package including data and information from three categories: land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model, a series of timber supply forecasts is produced, reflecting different starting harvest levels, decline rates, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen which attempts to avoid excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands is maintained. This is known as the 'base case' forecast, and forms the basis for comparison when assessing the effects of uncertainty on timber supply.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it. In some cases an AAC is determined that coincides with the base case starting point. In other cases, an AAC is determined that differs significantly from the modelled starting point.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which its predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are made on the basis of informed judgment, using currently available information about forest management, which may have changed since the original information package was assembled. Forest management data are particularly subject to change during periods of legislative or regulatory change, such as the enactment of the Forest Practices Code, or during the implementation of new policies, procedures, guidelines or plans.

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgment and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgments that may be based in part on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

Timber supply analysis

The timber supply analysis for TFL 14 was prepared by Timberline Forest Inventory Consultants (Timberline) under the direction of licensee staff. Timberline used its proprietary timber supply model Critical Analysis of Schedules for Harvesting (version 6) (CASH 6). This model can be used to project spatially-implicit or spatially-explicit timber supply forecasts. Spatially explicit in this case means that the model accounts for the spatial relationship between mapped cutblocks, while spatially implicit means that the model does not track cutblocks (i.e., it does not track the spatial relationship between cutblocks); but rather it approximates the timber supply impacts of implementing spatial restrictions using forest cover constraints.

For this analysis, the licensee used CASH 6 in a spatially explicit mode for the first 30 years of the forecast period and to develop the associated twenty-year plan. After the first 30 years of the analysis, the spatially-explicit cutblock adjacency constraint was no longer applied; a spatially implicit forest cover requirement was applied instead. BCFS Timber Supply Branch staff compared the theoretical maximum long-term harvest level for the management unit provided by the licensee to the long-term harvest level projected in the base case. Based on their prior experience, TSB staff indicated that the gap between the long-term harvest level and the theoretical level was greater than expected and the magnitude of this difference was not explained in the analysis.

Nevertheless, based upon my staff's experience in examining results from the CASH 6 model, as well as the results of models similar in nature to CASH 6, I am satisfied that it is capable of providing adequate projections of timber supply. In my consideration of the factors, described below, I am mindful of the model's potential underestimation of the long-term harvest level.

For TFL 14, the licensee presented a harvest flow projection entitled *Current Management Option* as the base case to which further analyses were compared. In the base case, the current AAC of 164 000 cubic metres was maintained for the first five years. Then over the subsequent 15 years, the harvest level decreased in five percent steps after each five-year period to 134 000 cubic metres per year. The projected harvest level then increased to 150 000 cubic metres per year for decades four through ten, and then increased to the long-term harvest level of 162 000 cubic metres per year.

I accept the licensee's assertion that its base case (*Current Management Option*) adequately reflects current management practices on TFL 14 and I find it forms a suitable basis for comparison when assessing the effects on timber supply of uncertainty in the assumptions used in the base case, as discussed above.

In addition to the base case, I was provided with a number of sensitivity analyses and projections of alternative harvest flows, carried out using the base case as a reference. These analyses examined the effect on timber supply of varying many of the assumptions used.

On August 14, 2000, the licensee also submitted a revised harvest forecast entitled *Revised Current Management Option*—included in the approved management plan—that is discussed under "Alternative harvest flows". Sensitivity analyses are discussed under the appropriate sections in this rationale. All of these analyses have been of assistance to me in the considerations, described below, which have led to my determination.

Consideration of Factors as Required by Section 8 of the *Forest Act*

Section 8 (8)

In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account
(i) the composition of the forest and its expected rate of growth on the area,

Land base contributing to timber harvesting

- general comments

The total area of TFL 14, as estimated from the inventory data, is 150 431 hectares, of which 74 388 hectares are forested land. The total area of the TFL has decreased by 10 678 hectares since the previous AAC determination due to the removal from the TFL of the upper Vowell creek watershed. This area was added to Bugaboo Provincial Park in 1995.

As part of the process used to define the timber harvesting land base (i.e., the land base estimated to be economically and biologically available for timber harvesting), a series of deductions was made from the gross land base. These deductions account for economic or ecological factors that operate to reduce the forest area available for harvesting. Of the forested land in TFL 14, 52 651 hectares, or approximately 35 percent of the total area, is assumed to be available for timber harvesting in the long term. This is the assumed timber harvesting land base.

In timber supply analysis, assumptions, and if necessary, projections, must be made about these factors prior to quantifying appropriate areas to be deducted from the productive forest area in order to derive the timber harvesting land base. In reviewing these deductions I am aware that some areas may have more than one classification—e.g., environmentally sensitive areas (ESAs) may also lie within riparian areas.

To ensure the accuracy of the timber harvesting land base calculation, it is imperative that no deduction be made more than once in respect of the same area of land, by virtue of it or of some part of it coming under more than one classification. Hence, a specific deduction for a given factor reported in the analysis or the AAC rationale does not necessarily reflect the total area with that classification; some portion of it may have been deducted earlier under another classification.

For TFL 14, I acknowledge that the above approach was used in the licensee's timber supply analysis to determine the timber harvesting land base. My consideration of each of the deductions applied in the derivation of the timber harvesting land base is presented in the following sections of this rationale.

- non-forested and non-productive areas

Non-forested and non-productive areas on TFL 14 include swamp, alpine areas, lakes, rock, existing roads and trails (as discussed further under *roads, trails and landings)*, and other non-productive forest. To account for these areas, the licensee excluded 76 042 hectares from the timber harvesting land base. The licensee also identified an additional 168 hectares of non-commercial cover (brush) and appropriately excluded these areas from contributing to timber supply.

I have considered the information presented to me respecting non-forested and non-productive areas and I am satisfied that the reductions applied were appropriate and suitable for use in this determination.

- economic and physical operability

Those portions of a forest management unit that are not physically accessible for harvesting, or that are not feasible to harvest economically, are categorized as inoperable and are excluded when deriving the timber harvesting land base.

In the previous timber supply analysis for TFL 14, approximately 20 270 hectares were excluded as inoperable. In his 1996 determination, the Chief Forester requested that operability for the TFL be reviewed. In response to this request, the licensee reassessed the operability classification for the TFL and in 1999 prepared revised operability mapping that was reviewed and accepted by BCFS district staff. The new operability information was used in the timber supply analysis, and 13 571 hectares were identified as inoperable, and therefore were excluded in deriving the timber harvesting land base. BCFS district staff agree with the criteria used to define the operable land base, and indicate that the assumptions regarding operability are representative of current practice. In response to my concern that the licensee may not be able to harvest stands at the margin of operability, the BCFS district staff indicate that they are very satisfied with the licensee's performance in these areas.

For this determination, in view of the revised operability mapping and the district's confirmation that the licensee has demonstrated performance in marginally operable areas, I accept the assumptions about economic and physical operability as incorporated in the base case.

- estimates for roads, trails, and landings

In timber supply analysis, a percentage of the productive forest was excluded from the timber harvesting land base to account for the losses resulting from the construction of roads, trails, and landings. Separate estimates were made for existing roads, trails, and landings, and for future roads, trails, and landings, to reflect both current access and anticipated road network requirements over time.

In estimating the area occupied by existing roads and trails, the licensee first located the existing road network from the mapped inventory. Roads classified as double line features occupied an area of 213 hectares. In order to estimate the area occupied by roads classified as single line features, the licensee conducted a field survey to determine the average widths of road site occupancy based on the BCFS standard categories of main road, secondary road, and trail. Based upon the results of the field survey the area occupied by roads classified as single line features was estimated to be 1566 hectares. Hence, the total reduction for existing roads and trails used in the analysis was 1779 hectares. Existing roads and trails were considered non-forest, non-productive land in the analysis, and were excluded under *non-forested and non-productive areas* above.

To account for the construction of future roads and trails, the timber harvesting land base was reduced by an additional 647 hectares based on the complete road network necessary to access all areas of the TFL as outlined in the licensee's twenty-year plan. For the purposes of calculating future road reductions, a width of 10 metres was assumed based on the length-weighted average of the existing 2-wheel and 4-wheel drive and overgrown roads.

For this analysis, no adjustment was made to productivity estimates to account for existing and future in-block trails and landings. BCFS district staff advise me that for the timber supply analysis recently completed in the adjacent Invermere TSA, a 3.5 percent reduction was applied to the volume estimates for regenerating stands to account for the loss of productive land as a result of the future construction of in-block trails and landings. They noted that in view of this licensee's consistently smaller landing sizes, the volume reduction factor to account for productivity losses on the TFL could reasonably be less than 3.5 percent and recommended a productivity reduction of about 2 percent.

Based upon my review of the assumptions regarding roads, trails, and landings, my discussions with BCFS staff, and my first-hand observations of the TFL, I concur with district staff. I therefore accept that the base case projection has overestimated regenerating stand yields by approximately 2 percent. This will affect the mid- to long-term timber supply, and I have accounted for this in my determination, as discussed in 'Reasons for decision'.

- environmentally sensitive areas

An environmentally sensitive area (ESA) is an area identified during a forest inventory that is particularly sensitive to disturbance and/or is significantly valuable for resources other than timber. ESA information was originally used to identify areas to exclude in

deriving the timber harvesting land base where more specific or detailed information was not available about a particular forest resource.

For the analysis, 511 hectares were excluded to account for areas where regenerating trees would be difficult, where maintaining recreation and/or wildlife resources is the primary objective, and where there is a high avalanche hazard.

To account for areas where soil stability is a problem the licensee used "level D" terrain stability mapping. The unstable terrain (class V) was considered to be unharvestable, and as a result, 100 percent of these class V areas were excluded in deriving the timber harvesting land base. However, all of the potentially unstable (class IV) terrain was considered to be harvestable, as harvesting methods such as cable systems, helicopters, or long-line harvesting systems are available to reduce soil disturbance. A total of 3566 hectares of these areas were therefore included in the timber harvesting land base in the analysis.

District staff have reviewed the reductions for sensitive soils and agree that the terrain stability information is more accurate, and should supersede the previous soils ESA mapping for the TFL. Review of the licensee's twenty-year plan indicates that 1461 hectares of class IV terrain are scheduled for harvesting. While BCFS district staff are not aware of any harvesting in this terrain class on the TFL, they confirm that similar areas in the adjacent Invermere TSA are being harvested with no adverse impacts on soils.

In conclusion, while I am not aware of any information that indicates that the licensee will not harvest in the class IV areas, I am concerned that harvesting in these areas may not occur to the extent assumed in the base case. Therefore, I request that BCFS district staff monitor the licensee's harvesting performance in the class IV terrain and present this information for consideration at the next determination.

- Bugaboo Provincial Park

In 1995, an 11 026-hectare extension to Bugaboo Provincial Park was created by Order in Council. The park extension included area within TFL 14, primarily in the Vowell creek watershed. These lands contain large areas of alpine and glacial ice-fields, while the Vowell creek watershed provides some mid- and high- elevation habitat types in the ESSF wet mild (ESSFwm) biogeoclimatic zone variant. These areas were included in the park because of their high wilderness recreation value for mountaineering and hiking, as well as the important grizzly bear and mountain goat habitat they provide.

Preliminary mapping indicated that the park extension would reduce the TFL land base by an estimated 10 186 hectares, and in the previous AAC determination, the chief forester took into account a land base reduction of 10 186 hectares.

Application of mapping techniques that more accurately account for the height of land have led to improved estimates of the park extension area. For the purposes of this analysis, the licensee deducted 10 678 hectares from the total area of the TFL to account for the park extension.

However, the most recent estimate, based on a park boundary delineation from the Land Use Co-ordination Office (LUCO) and on recently updated TFL boundaries indicates that the park area previously within TFL 14 is closer to 10 930 hectares. BCFS staff have indicated that the actual area of the park within the TFL, as well as some height-of-land discrepancies on the remainder of the TFL, requires further review and is expected to be resolved prior to the next AAC determination.

While I am aware that the Bugaboo Park extension area has not yet been formally removed from the area of the TFL, the area has been formally established and therefore my determination assumes no contribution to the timber supply from the designated park area. The licensee incorporated a land base reduction of 10 678 hectares in the current analysis, which is slightly smaller than the land base now believed to be associated with the park. However, the 252 hectares not addressed in this analysis are lands that occur in the alpine, hence uncertainty in this area does not impact the area of productive forest land.

Therefore, while the exact size of the total land base is uncertain, I am satisfied that this does not impact the size of the timber harvesting land base assumed in the base case. I encourage BCFS staff to resolve the land base discrepancies prior to the next determination.

- non-merchantable and low productivity stands

In the timber supply analysis, several classes of stands were excluded from the timber harvesting land base to account for low productivity and non-merchantable stands that are not typically harvested.

Sites to be excluded were identified on the basis of low volume, low site index, and excessive or inadequate stocking density. Minimum requirements for inclusion in the timber harvesting land base were increased for areas on slopes in excess of 45 percent. Stands of predominantly deciduous tree species were also excluded. As a result, a total of 3756 hectares were excluded from contributing to timber supply. This area was later revised when the licensee's approach to inventory adjustment was reviewed (see below under Existing forest inventory) and was found to be 3762 hectares.

BCFS district staff believe that the assumptions regarding non-merchantable and low productivity stands are representative of current practice. I consider the minor underestimation of the area covered by these stands to be insignificant, and I am satisfied that there has been an adequate accounting for such sites in the analysis.

- specific geographically defined areas

In 1982, an 85-metre wide (66 hectares) BC Hydro corridor was deleted from the TFL. At that time, BC Hydro also filed a notation of interest for an additional 750-metre wide right-of-way. Requests by the licensee to have the area of the corridor returned to the TFL and the notation removed have not been accepted by BC Hydro. I acknowledge that there is some uncertainty as to the future use of the area covered by the notation of interest. However, I am not prepared to speculate on whether or not this area will be removed from the TFL and I do not consider this to have any bearing on this

determination. Any change in the status of the area covered by the notation of interest can be accounted for in subsequent determinations.

- general size of the timber harvesting land base

Review of the analysis results by BCFS Timber Supply Branch staff indicated that the licensee's model did not "harvest" 4982 hectares (10 percent) of the timber harvesting land base during the base case forecast period. Timberline staff indicated that many of the blocks that were not "harvested" in the modelling contained individual stands that were being retained to meet forest cover constraints, such as those for riparian management. However, the approach used in defining harvest blocks in the analysis (see *spatial cutblock and patch aggregation* and *minimum harvestable ages*) resulted in a much larger area being reserved than was required to meet the management constraints.

Based upon my discussions with BCFS Timber Supply Branch and district staff, I accept that the timber harvesting land base as modelled in the base case was overly constrained as a result of the approach used in the model's block definition. This constraint affects the mid- to long-term timber supply and I have accounted for this in my determination, as discussed in 'Reasons for decision'.

Existing forest inventory

- current forest inventory

The most recent inventory of the TFL was completed in 1986 based upon aerial photography and field sampling. BCFS Resources Inventory Branch conducted an inventory audit of the TFL in 1994 and I will discuss this in detail under *volume estimates for existing stands*. In the timber supply analysis, the 1986 inventory file data was used. Inventory updates for harvesting and silviculture activities, current to September 1998 and January 1999 respectively, were incorporated in the analysis.

I have considered the information regarding the current forest inventory used in the timber supply analysis, and I am satisfied that— subject to the concerns discussed below under *volume estimates for existing stands*—it forms an acceptable basis for this determination.

- species profile and age-class distribution

Within the timber harvesting land base, stands with lodgepole pine as the dominant species are the most common (46 percent). The next most prevalent stands are those dominated by spruce (16 percent), Douglas-fir (13 percent) and balsam (14 percent). There is a minor component of predominantly deciduous stands, but as discussed under *non-merchantable and low productivity stands*, in the analysis these areas were excluded in deriving the timber harvesting land base.

Approximately 16 percent of the timber harvesting land base is occupied by stands 140 years of age or older. The balance is distributed among a variety of age classes with 46 percent of the operable land base containing stands 61 to 100 years of age.

I have reviewed the species profile and age-class distribution information for TFL 14, and am satisfied that it represents the best information available for this analysis.

- age representation

The analysis prepared by the licensee was generally based upon 10-year periods, with harvest simulation occurring at the period midpoint. As a result, following harvest the stands harvested during the period were all assigned the same age rather than the ages being distributed over the 10-year period.

In order to examine the implications of this approach to age representation, the licensee prepared a timber supply forecast, based upon the assumptions in the *Revised Current Management Option* (see Alternative harvest flows) that examined the effect on timber supply of using a 5-year period. The results of this analysis indicated a decrease in the mid-term timber supply of approximately 10 percent for decades 7 and 8, or about a 2 percent cumulative decrease in timber supply over the first 100 years of the forecast period.

From review of this information, and based on discussions with BCFS staff, I am prepared to accept that the approach used in age representation in the analysis for this determination may result in a small overestimation of timber supply by about 2 percent over the short and mid-term. I have accounted for this in my determination, as discussed in 'Reasons for decision'.

- aggregation procedures

In the timber supply analysis, the inventory for TFL 14 was aggregated into analysis units based on inventory type group (leading species), site productivity class, age range, and slope class. Existing and managed stand yield tables were generated for each analysis unit.

Analysis units were also developed for the Douglas-fir leading stands in the visually sensitive area of the Columbia Bench, where partial harvesting is currently practiced. A separate analysis unit was also developed for stands with a history of intermediate utilization. These stands that were partially harvested many years ago but that are not anticipated to be partially harvested in the future.

I have reviewed the aggregation procedures used by the licensee and I am satisfied that there are no issues that would impact this determination.

- spatial cutblock and patch aggregation

The timber supply analysis for TFL 14 was spatially explicit for the first 30 years of the timber supply forecast period. Stands, as identified from the forest cover inventory, were grouped into blocks by the licensee. Stands that had not been specifically assigned to a block by the licensee were assumed to be blocks. Within the model, blocks were indivisible and were not eligible for harvest until all of the component stands within a block had attained the minimum harvest attributes assigned to their respective analysis unit and were not required in some way to meet a resource emphasis area (REA) forest cover requirement.

For the first 30 years of the base case, blocks were aggregated into patches of pre-determined maximum size. Review of the analysis results indicated that at the end of the forecast period, 69 percent of the area harvested was in patches less than 30 hectares in size with 50 percent of the patches being less than 1 hectare in size. The total area represented by blocks and patches of less than 1 hectare is small—only about 3 percent of the area harvested. However, in the model these small patches could impact the availability for harvest of larger, adjacent cutblocks. These adjacency implications of the approach used in block definition were not investigated.

As blocks within the model are indivisible, if a block contained even a single stand that did not meet a required condition, such as minimum harvest age, or green-up height or that was required to meet any forest cover constraint, the entire block was reserved from harvesting until the condition was met. In order to examine the effect of this aspect of block processing using the base case block definitions, the licensee prepared an analysis. In this analysis a harvest forecast was developed without any of the forest cover constraints but still using the blocking definitions (unconstrained blocks). A second harvest forecast using neither forest cover constraints nor the blocking definitions (unconstrained stands) was also obtained. There was a significant difference in the projected short- and mid-term timber supplies between these two forecasts, with the unconstrained stands approach resulting in a 13 percent higher—20 000 cubic metres per year—harvest flow than the unconstrained blocks approach in the first 120 years of the forecast period.

I have reviewed the information regarding the spatial aggregation of stands and have discussed this information with BCFS staff, and I am satisfied that the approach taken in the analysis for TFL 14 overly constrained the availability of blocks for harvesting, and this resulted in an underestimation of available timber supply. In my determination therefore, as noted in 'Reasons for decision', I have accounted for an underestimation of up to 13 percent in the short- and mid-term timber supply. I recommend that the licensee review the approach taken in block definition prior to the next determination, as the current blocking pattern in conjunction with the block processing used in this analysis appears to be artificially constraining timber supply.

- volume estimates for existing stands

BCFS Resources Inventory Branch conducted an inventory audit of the TFL in 1994. The audit indicated that inventory volumes for existing natural stands older than 60 years of age might be underestimated by 26 percent. In view of this considerable uncertainty in the volume estimates for existing mature stands, the chief forester, in the rationale for the previous AAC determination, instructed the licensee to conduct further inventory sampling.

In response to this instruction the licensee engaged Timberline to conduct and report on the requested sampling. The report, entitled *TFL 14 Management Plan Number 8 – Inventory audit and adjustment strategy*, was reviewed and accepted by BCFS Resources Inventory Branch. The results indicated that in operable, coniferous stands over 40 years of age, the volumes were underestimated. The implication of adjusting the inventory to

account for the study results was an increase in total inventory volume from about 8.7 million cubic metres to about 10.5 million cubic metres.

Subsequent to the analysis, BCFS Resources Inventory Branch expressed concern regarding the methodology used by Timberline in deriving the original inventory adjustment in the 1999 study. Timberline reviewed and revised the inventory adjustment process with the result that the adjusted total inventory volume (i.e., the sum of individual stands from the inventory files) for the timber harvesting land base was approximately 9.8 million cubic metres.

In the analysis, the licensee developed aggregate yield tables for each analysis unit based on the area-weighted attributes from the forest inventory of species composition (top three species for each inventory group), site index, crown closure, and stocking class for all stands using the Variable Density Yield Prediction (VDYP) model (version 6.4), which was developed by the BCFS Resources Inventory Branch. The volumes for existing natural stands in which species and stocking have not been managed—defined as those stands older than 25 years of age—were projected using this model. For stands less than 25 years of age, and once stands currently older than 25 years of age were harvested for the first time in the analysis, their future yield was projected using estimates from the managed stand yield tables (see below under *volume estimates for managed stands*). The starting total analysis unit volume in the simulation was 9.8 million cubic metres.

I have reviewed the information regarding the existing forest inventory, including the results of the revised inventory adjustment process. In consideration that the revised process resulted in a total inventory volume for the timber harvesting land base that was the same as the starting volume applied in the analysis, I will make no adjustments in this regard. In conclusion, I am satisfied that the volumes for existing stands estimated in the analysis are adequate for use in this determination.

Expected rate of growth

- site productivity estimates

Inventory data include estimates of site productivity for each forest stand, expressed in terms of a site index. The site index is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow. This in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced, and the ages at which a stand will satisfy mature forest cover requirements and reach a merchantable size.

In general, in British Columbia, it has been found that site indices determined from younger stands (i.e., less than 31 years old), and older stands (i.e., over 150 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in several areas of the

province where studies—such as the Old-Growth Site Index (OGSI) 'paired plot' project and the 'veteran' study—as well as results from using the Site Index Biogeoclimatic Ecosystem Classification System (SIBEC) suggest that actual site indices may be higher than those indicated by existing data from old-growth forests. In recent years it has been concluded from such studies that site productivity has generally been underestimated by older inventories; managed stands tend to grow faster than projected by inventory-based site index estimates from old-growth stands.

Multiple site indices were used in the analysis for TFL 14. Prior to initial harvest, site indices for all currently existing stands— except those less than 40 years of age— were based on the height and age information described in the licensee's report *TFL 14 Management Plan Number 8 – Inventory audit and adjustment strategy*. Stands 40 years of age or younger, were assigned site indices on the basis of detailed ecological mapping and an associated site index sampling project (SIBEC) for the license area. This project, summarized in a report entitled *TFL Management Plan Number 8 – Ecologically based productivity measurements*, was prepared by the licensee in September, 1999, and was approved by BCFS Research Branch. Upon regeneration, stands currently over 140 years of age and intermediate utilization stands were also assigned a site index based on SIBEC.

The revised inventory adjustment procedures, discussed under *volume estimates for existing stands,* resulted in an overall site index decrease of about one metre as compared to the site indices calculated and used for natural existing stands in the base case. A sensitivity analysis that assessed the implications to the short-term timber supply of applying the revised inventory adjustment to the natural (existing) stand yields was submitted by Timberline to BCFS Timber Supply Branch on November 29, 2000. This analysis indicated that there was no change to the harvest flow in the first 50 years of the timber supply analysis period.

I have reviewed and discussed the information regarding site productivity estimates with BCFS Timber Supply Branch and district staff. I am mindful that the site indices for existing stands over 40 years of age were overestimated by one metre in the base case; however, sensitivity analysis indicates that the short-term timber supply in the TFL is not sensitive to a change in site index of this magnitude. Therefore, I am satisfied that the site productivity estimates assumed in the base case are adequate for use in this determination.

- volume estimates for managed stands

The licensee developed volume estimates for stands regenerating on NSR areas, for stands less than or equal to 25 years of age, and for all future regenerating stands using the Table Interpolation Program for Stand Yields (TIPSY). All managed stand yield tables were reviewed and accepted by the BCFS Research Branch for use in the analysis. District staff have reviewed and agree with the analysis assumptions regarding the expected yields from managed stands.

I have reviewed the volume estimates for managed stands and discussed these with BCFS staff and I am satisfied that they are suitable for use in this determination.

- operational adjustment factors

TIPSY projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests, diseases, and significant brush competition in the stand. Certain operational conditions, such as less than ideal tree distribution, small non-productive areas, endemic pests and diseases, or age dependent factors such as decay, waste and breakage may cause yields to be reduced over time. Operational adjustment factors (OAFs) are applied to yields generated using TIPSY to account for losses of timber volume as a result of these operational conditions. OAF 1 can account for factors affecting the yield curve across all ages, such as small stand openings. OAF 2 can account for factors whose impacts tend to increase over time, and whose influence on a stand may often be reduced through management practices, such as pests, disease, decay, waste, and breakage.

In the analysis, the standard provincial reductions of 15 percent for OAF 1 (accounting for less than ideal tree distribution, small non-productive areas, endemic pests and disease, and random risk factors such as windthrow), and 5 percent for OAF 2 (accounting for decay, waste, and breakage) were applied. BCFS district staff advise me that the OAFs assumed in the analysis are representative of current conditions on the TFL. I have reviewed the assumptions regarding OAFs used in the analysis and I am satisfied that these assumptions are generally appropriate for use in this determination.

- volume estimates for partially harvested stands

Volume estimates for partially harvested stands, consisting primarily of Douglas-fir leading stands in the visually sensitive area of the Columbia Bench landscape unit, were developed using Prognosis —a growth and yield model. For the purposes of this analysis, Prognosis was calibrated using TFL 14 specific data that were collected at the same time as the data for the inventory adjustment project (see *current forest inventory*). Following calibration, Prognosis was used to generate partial harvest analysis unit yield tables that were approved for use in this analysis by the BCFS Research Branch.

In the analysis, initial harvesting of stands in partial harvesting analysis units was assumed to occur between the ages of 60 and 100 years. These stands were considered to be available for final harvesting 30 years after initial harvest. After final harvest, stands were to be assigned an age of 20 years to approximate the advanced regeneration of young trees that had developed prior to final harvesting.

Review of the analysis results indicated that the advanced regeneration age of 20 years was not implemented as intended in the model. Therefore, stands that should have been available for harvest in 40 to 80 years following initial final harvest were only available after 60 to 100 years. Given that stands projected to be partially harvested only occupy 10 percent of the timber harvesting land base, BCFS staff have estimated the impact on timber supply to be small, less than 2 percent in the mid to long term.

District staff have reviewed the assumptions regarding partially harvested stands for this TFL and confirm that a 20-year advanced regeneration age is reflective of current practice.

For this determination, I note that the intended advanced regeneration age of 20 years for partially harvested stands was not implemented in the analysis. As a consequence, timber supply on the 10 percent of the timber harvesting land base occupied by stands identified for partial harvesting has resulted in a small — less than 2 percent— underestimation in the mid- to long-term timber supply, and I have taken this into account in my determination, as discussed in 'Reasons for decision'.

- *minimum harvestable ages*

A minimum harvestable age is an estimate of the earliest age at which a forest stand has reached a harvestable condition and has met minimum merchantability criteria. The minimum harvestable age assumption largely affects when second growth stands will be available for harvest. In practice, many forest stands will be harvested at older ages than the minimum harvestable age, due to economic considerations and constraints on harvesting that arise from managing for other forest values such as visual quality, wildlife, and water quality.

In the TFL 14 timber supply analysis, minimum harvestable age estimates were based on stands meeting four criteria: a minimum acceptable volume, a minimum average diameter at stump height, a minimum average diameter at breast height, and a minimum percentage of culmination age (the age at which a stand's volume increment is at a maximum). In the analysis, the corresponding minimum harvestable ages of stands resulting from the application of these criteria ranged from 40 to 180 years. However, the average actual age at which stands were harvested in the model was above 100 years for the first half of the forecast period, after which it declined to 90 years. BCFS district staff have reviewed and accept the assumptions regarding minimum harvestable age.

A review of the range of stand ages within blocks used in the analysis indicated the timber harvesting land base contains blocks consisting of contiguous stands with age ranges between 0 and 188 years. While differences in stand ages within operationally defined blocks is not unreasonable, the broad range of ages found indicates that very young stands were assimilated into blocks with stands that already exceeded their respective minimum harvestable age. The wide range of stand ages allowed in the delineation of blocks contributed to the exaggerated impacts of forest cover constraints, which I described earlier in my rationale, under *general size of the timber harvesting land base.*

I have reviewed the assumptions used to determine minimum harvestable ages for the stands on TFL 14, and notwithstanding the conclusion I reached under *general size of the timber harvesting land base*, I accept that the ages are reasonable and are suitable for use in this determination.

(ii) the expected time it will take the forest to become re-established on the area following denudation,

Regeneration delay

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings.

In timber supply analysis, regeneration delay is used to determine the starting point of tree growth for the yield curves that project volumes over time.

In the timber supply analysis, the licensee assigned an area-weighted average regeneration delay of three years to all future stands based on an assessment of recent performance. Stands were assumed to be regenerated with a mix of coniferous species through a combination of planting and natural regeneration.

BCFS district staff reviewed the regeneration delays and confirm that they adequately reflect current practice. Having reviewed the assumptions used in the analysis and discussed them with BCFS staff, I accept the estimates of regeneration delay as suitable for this determination.

Impediments to prompt regeneration

Impediments to prompt regeneration that are not accounted for in the analysis increase the uncertainty in the growth and yield estimates used in the timber supply analysis.

The licensee conducted a forest health overview of 2193 hectares on the TFL. The review indicated that juvenile pine stands were at risk of damage or mortality due to pests such as blister rust, western gall rust, pitch moth, and root collar weevil. The licensee has indicated that stands experiencing pest damage, which as a result are at risk for reductions in stand stocking density below minimum levels, will be monitored and treated appropriately.

I have reviewed the information regarding impediments to prompt regeneration and as discussed under *operational adjustment factors*, managed stand yields used in the analysis were reduced to account for endemic pest damage. For this determination, I am satisfied that any impediments to prompt regeneration are being satisfactorily addressed and that there is no reason to adjust the base case projection on this account.

Not-satisfactorily restocked areas

Not-satisfactorily-restocked (NSR) areas are those areas where timber has been removed, either by harvesting or by natural causes, and a stand of suitable forest species and stocking has yet to be established. Where a suitable stand has not been regenerated and the site was harvested prior to 1987, the classification is 'backlog' NSR. All other NSR is considered 'current' NSR.

There is no backlog NSR on TFL 14. A total of 1569 hectares has been classified as current NSR. In the analysis the licensee assumed this area would be regenerated within two years. District staff agree with the estimate of current NSR and the assumptions regarding regeneration for these areas.

Having reviewed the information with staff, I accept that this factor has been modelled appropriately in the base case and is therefore suitable for this determination.

(iii) silvicultural treatments to be applied to the area,

Silvicultural systems

The predominant silvicultural system currently in use on TFL 14 is clearcutting. According to the licensee, in the visually sensitive areas on the Columbia Bench, partial harvesting systems are currently in use. To date 1076 hectares have been harvested using this system and a further 4079 hectares have been identified as candidate areas (i.e., the total area projected to be managed using partial harvesting is 5125 hectares or about 10 percent of the timber harvesting land base).

In the analysis, even-aged management was modelled for all stands on the timber harvesting land base, with the exception of the visually sensitive areas along the Columbia Bench, where shelterwood (partial harvesting) was modelled. The combined first-entry and final-entry shelterwood harvests contribute about 15 000 cubic metres per year to the annual harvest levels for the first 50 years of the base case. As discussed under *volume estimates for partially harvested stands*, stands were assumed to be eligible for partial harvesting between the ages of 60 and 100 hundred years of age. If stand age exceeded 100 years without a first-entry harvest the area was assumed to be eligible for clearcutting.

However, BCFS district staff have indicated that stands currently exceeding the modelled 100-year eligibility age are being partially harvested on the TFL and believe that it is unlikely that these stands will be clearcut, as they are located in a partial retention visual quality class in a known scenic area. In any event, examination of the analysis results indicated that very little of the area eligible for clearcutting was actually "harvested" in the model due to other resource emphasis constraints. In addition, a sensitivity analysis prepared by the licensee, indicated that shifting from partial harvesting to clearcut harvesting in the visual quality partial retention zone had no effect on timber supply. BCFS district staff are supportive of the type and extent of partial harvesting systems used on the TFL.

Having reviewed and discussed with BCFS district staff the silvicultural systems currently used on TFL 14, I am satisfied that the information used in the base case is adequate for use in this determination.

Tree improvement

The Forest Practices Code requires the use of improved (class A) seed from seed orchards for regeneration where available. Class A seed is the product of B.C.'s forest genetics program, which uses naturally-occurring, well-performing trees and standard breeding techniques to produce trees with improved attributes, including enhanced growth.

According to the licensee, class A spruce seedlings have been used extensively for reforestation on the TFL since 1997. In the base case, existing managed spruce stands were modelled with no genetic improvement due to the short history of use of genetically improved spruce seedlings on the TFL. For future regenerated stands, a 10 percent

increase was applied to the managed stand yield tables for spruce after initial harvest to account for the use of genetically-improved spruce seedlings.

BCFS district staff indicated that there is an increase in the use of planted lodgepole pine seedlings on this TFL for the regeneration of pine stands rather than the reliance on natural regeneration as was historic practice. Currently class A pine seedlots appropriate for use on this TFL are nearing production; however, to date no genetically improved lodgepole pine has been planted on the TFL.

A sensitivity analysis was provided by the licensee to examine the effect on timber supply of a 10 percent genetic gain in regenerated lodgepole pine stand volume. The results indicate a small (2 percent) increase in the harvest level across the entire forecast period; however, given the apparent flexibility in the short-term harvest levels (see 'Alternative harvest flows') it is difficult to attribute small changes in short-term harvest levels to any one factor.

In summary, the licensee will shortly have genetically improved pine seedlings available for planting. As lodgepole pine-leading stands comprise a large proportion of the timber harvesting land base on this TFL, I am confident that the timber supply projected in the base case is probably underestimated by about 2 percent in the mid to long term, and will discuss this further under 'Reasons for decision'.

Incremental Silviculture

Incremental silviculture includes activities such as commercial thinning, juvenile spacing, pruning and fertilization that are beyond the silviculture activities required to establish a free-growing forest stand.

The licensee indicates that no incremental silviculture treatments are being applied with regularity at this time on the TFL.

I have reviewed this information and for this determination, I accept that the analysis assumptions appropriately excluded incremental silviculture.

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

Utilization standards

Utilization standards define the species, dimensions and quality of trees that must be harvested and removed from an area during harvesting operations. In the TFL 14 timber supply analysis, the utilization standards assumed for most species were a minimum 17.5-centimetre diameter at breast height (dbh), a 30-centimetre maximum stump height and a minimum 10-centimetre top diameter inside bark. For lodgepole pine, a minimum dbh of 12.5 centimetres was assumed.

BCFS district staff confirm that the assumptions used in the analysis reflect current interior utilization standards, as well as the standards required in current practice.

I have reviewed the assumptions employed in the base case, and believe them to provide a reasonable accounting of utilization standards.

Decay, waste, and breakage factors

The VDYP model used to project volumes for natural stands incorporates estimates of the volumes of wood lost to decay, waste, and breakage. Decay losses are built into the volume estimates, while standard waste and breakage factors are applied to the analysis in the development of VDYP yield curves. These loss estimates have been developed for different areas of the province based on field samples.

The decay, waste, and breakage factors for forest inventory zone (FIZ) G and for TFL 14 (Special Cruise-314) were applied in the analysis. For regenerated stands, as previously discussed (see *operational adjustment factors*), the TIPSY model incorporates OAFs that account for anticipated decay, waste and breakage.

I am satisfied that the estimates for decay, waste, and breakage on which the timber supply was based represents the best available information and is suitable for use in this determination.

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production,

Integrated resource management objectives

The Ministry of Forests is required under the *Ministry of Forests Act* to manage, protect, and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock, and the realization of fisheries, wildlife, water, outdoor recreation, and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply must be considered in AAC determinations.

- resource emphasis areas

In order to reflect the full range of resource values in the timber supply analysis, areas requiring similar forest cover requirements were grouped together into resource emphasis areas (REAs). REAs for this analysis were identified by the licensee on the basis of wildlife habitat requirements, riparian management areas, visually sensitive areas, integrated resource management areas, and the special resource management zones (SRMZ) identified in the Kootenay-Boundary Land Use Plan (KBLUP) and the Kootenay-Boundary Higher Level Plan Order. With the exception of the riparian management areas, REAs represent largely contiguous geographic areas containing productive forest both within and outside of the timber harvesting land base. All productive forest can contribute to the forest cover constraints.

Forest cover constraints applied to stands within each REA in the analysis are intended to meet specific resource management needs by controlling the removal and retention of forest cover. Forest cover constraints were developed by the licensee, in conjunction with BCFS district staff and staff from the Ministry of Environment, Lands and Parks (MELP) for each REA to meet specific requirements for forest cover. Areas not identified for a

specific resource use other than timber production were placed in an integrated resource management REA.

- cutblock adjacency/green-up

To manage for resources such as water quality, soil stability, wildlife and aesthetics, and to avoid concentrating harvesting-related disturbance in particular areas, operational practices limit the size and shape of cutblocks and maximum levels of disturbance (as reflected by the area covered by stands of less than a specified height), and require minimum green-up heights for regeneration on harvested areas before adjacent areas may be harvested.

In the timber supply analysis, REA-specific green-up heights for all species other than lodgepole pine were derived using TIPSY. Green-up heights for lodgepole pine were developed using an early height growth model developed by BCFS Research Branch. The green-up height for stands within the area classified as SRMZ (see *special resource management zones*) was 5 metres, for stands in the visually sensitive area along the Columbia Bench —assigned a moderate visual quality objective—5.7 metres, and for stands in enhanced resource management zones (ERMZ)—approximated in the base case by the integrated resource management REA—2 metres (consistent with the Kootenay-Boundary HLP Order). For adjacency constraints associated with patches (see *spatial cutblock and patch aggregation*), patch green-up in the base case was assumed to be 10 years, as this approximates the time it takes for lodgepole pine stands, which cover the majority of the timber harvesting land base, to reach 2 metres in height.

Green-up height requirements in the KBLUP-IS are based upon silvicultural heights; whereas, in the analysis the licensee used inventory top height information. Silvicultural heights are about 80 percent of inventory top height at the same age due to differences in measurement criteria (i.e., it takes longer to attain a 2-metre silviculture height than a 2-metre inventory top height). Therefore, in the base case the time taken to achieve green-up was probably underestimated. A height-based sensitivity analysis was not provided; however, a sensitivity analysis that assessed the timber supply impacts of increasing or decreasing patch green-up age by 5 years from the 10 year age assumed in the base case had little effect on timber supply. The increase in age corresponding to a 0.5 metre increase in green-up height would be less than 5 years.

In the base case, a maximum of 33 percent of the timber harvesting land base, within each landscape unit, exclusive of visually sensitive areas, was allowed to be covered with trees less than 2 metres in height. While this spatially-implicit constraint was applied over the whole forecast period, for the first 30 years a spatially-explicit adjacency constraint was also applied. Review of results from the base case indicated that this spatially-implicit requirement could have been reduced to 25 percent before being limiting in any landscape unit.

Therefore, while there was a slight underestimation of green-up height used in the analysis, sensitivity analysis indicates that the timber supply in the short term is not sensitive to such small changes in green-up. For this determination, I accept that green-

up in the IRM areas was modelled appropriately and make no adjustments on account of this factor.

- special resource management zone

The KBLUP has identified a special resource management zone (SRMZ) in the north end of the TFL within which recreation, connectivity, and wildlife habitat are considered especially important. Management practices within the SRMZ were modelled in the analysis through the creation of a specific resource emphasis area. In consultation with the BCFS district staff, the licensee developed a forest cover constraint that allowed a maximum of 25 percent of stands within the timber harvesting land base of the SRMZ to be less than 5 metres in height.

I note that the specific management requirements for the SRMZ were not established in the HLP order; however, the licensee has indicated that it understands the needs of other resource users in the area and wishes accommodate them. I am mindful that the recommendations for this area from the KBLUP-IS were not included in the HLP Order, and this creates uncertainty as to the actual management that will be practiced on this area. Until management practices are confirmed within this area, I am prepared to accept that the forest cover requirement applied provides some additional accounting for the resources identified in the KBLUP-IS. Any differences between actual management practices and the assumptions incorporated in the analysis can be reviewed at the time of the next determination.

- recreation

The TFL is used extensively for a variety of recreational activities including commercial heli-skiing and backcountry hiking. According to Management Plan No. 8, the licensee consults regularly with other stakeholders and, where feasible, schedules harvesting and other forest management activities to complement the plans of other resource users. Examples of such cooperation include the application of partial cutting, or glading, to enhance heli-skiing opportunities in transition areas between open alpine areas and densely-forested valley bottoms.

A recreation resources inventory for the entire TFL was completed by the licensee in 1994 for Management Plan No.7. This process led to the exclusion from the timber harvesting land base of 14 hectares of area classified as recreation reserves. Apart from the exclusion of the reserves, which staff indicate was appropriately reflected in the analysis, BCFS staff indicated that management considerations for recreation can be accommodated without impacting timber supply on TFL 14.

I have considered this information and for this determination, I accept that the analysis assumptions regarding recreational use appropriately reflect current practice.

- visually sensitive areas

Careful management of scenic areas visible from communities, public use areas and travel corridors is an important forest management objective. The Forest Practices Code enables the management of visual resources by providing for scenic areas to be identified

and made known, and by providing for the establishment of visual quality objectives (VQOs) that guide the management practices on a scenic area. To achieve this, visual landscape inventories are carried out to identify, classify and record visually sensitive areas. On completion of such an inventory, a specialist may derive recommended visual quality objectives (RVQOs) of preservation, retention, partial retention, modification or maximum modification to identify levels of alteration that would be appropriate for particular areas. The Forest Practices Code requires visually sensitive areas to be identified by the district manager or in a higher level plan, and to be made known to licensees. The district manager or a higher level plan may also establish the recommended VQOs.

To achieve VQOs, constraints are placed on timber harvesting, road building and other forest practices. The constraints, which are based on experience, research findings and public preferences, are expressed in terms of forest cover requirements that relate to the maximum percentage of a viewshed that may be harvested at any one time, and to 'visually effective green-up' (VEG)—the stage at which a stand of reforested timber is perceived by the public to be satisfactorily greened-up from a visual standpoint.

An area with a visual quality objective of partial retention was identified by BCFS district staff in 1993 – 1994 for the Columbia Bench landscape unit and was subsequently established as a known scenic area by the KBLUP Higher Level Plan Order (see Kootenay-Boundary Land Use Plan). This area, which comprises about 10 percent of the timber harvesting land base, was modelled as a visually sensitive REA in the timber supply analysis.

The approach used in the analysis for accounting for visually sensitive areas on TFL 14 are consistent with the provincial policy described in the *1998 Procedures for Factoring Recreation Resources into Timber Supply Analyses*. This document describes a provincial average allowable alteration percent range for each VQO, developed by BCFS specialists for use in timber supply analysis.

In the analysis, the majority of the partial retention zone was assumed to be partially harvested and therefore no forest cover requirement was applied. Review of the analysis results indicate that the level of allowable disturbance fell within the acceptable range to maintain a partial retention designation as outlined in the provincial policy.

The remaining area, comprised of 1589 hectares of mature lodgepole pine stands, was modelled with a modification visual quality objective. The licensee believes that this designation is more reflective of expected management in stands at risk of mountain pine beetle attack. A maximum disturbance rate of about 20 percent and a VEG height of 5.7 metres were developed for stands with a modification visual quality classification, using the *Procedures for Factoring Visual Resources into Timber Supply Analyses*.

BCFS district staff advise me that the assumptions regarding visually sensitive areas are consistent with current management and concur that a modification visual quality class may be necessary for mature lodgepole pine stands.

I have reviewed the information regarding visually sensitive areas on TFL 14. I recognize that there may be some uncertainty as to the levels of disturbance that will be allowed in

these stands over time. However, in consideration of the small size of the land base involved, I do not expect small variations in disturbance levels to significantly impact timber supply. As more information on these areas becomes available it can be factored into future analyses. For this determination, I am satisfied that the assumptions made in the analysis are generally adequate for use in this determination.

- cultural heritage resources

TFL 14 is within the asserted traditional territory of the Ktunaxa Kinbasket First Nation. The Ktunaxa/Kinbasket Tribal Council (KKTC) has submitted a comprehensive land claim, which covers the southeast corner of the province, including TFL 14. Treaty negotiations are currently at the stage of developing an agreement-in-principle.

Archaeological overview assessments (AOA) are being conducted for the entire TFL. Upon completion the AOA will show areas with high and moderate potential of archaeological sites, where further field reconnaissance and archaeological impact assessments may be required. The licensee indicates that no archaeological sites have been found on TFL 14 to date.

In the timber supply analysis no specific reductions were applied to account for cultural heritage sites. Reductions applied for wildlife tree patches and riparian management areas typically provide some accounting for cultural heritage resources. BCFS district staff are satisfied that the analysis assumptions were appropriate given that no sites have yet been identified on TFL 14.

I am mindful of the licensee's commitment to work with First Nations operationally to ensure cultural heritage resource values are properly managed. Should any sites be identified in the future, they can be accounted for in future analyses. For this determination, I am satisfied that the analysis assumptions were based on the best available information regarding cultural heritage resources, and make no adjustments on this account.

- water resources

The licence area includes the entire watershed of the Spillimacheen River and its tributaries, Bobbie Burns and Vowell creeks. Although water is not drawn directly for local use, the watershed has significant downstream value as part of the Columbia River catchment area.

There are several small domestic watersheds (DWs) predominantly in the eastern portion of the TFL. With the exception of a small area in the Vowel creek watershed, most of the area within these DWs coincides with partial retention visual areas, where partial cutting will be practiced, and with elk winter range, where a portion of the forest will always be kept above 101 years of age. As a result, no specific requirements for water resources were modelled in the analysis.

Management Plan No. 8 indicates that the licensee will minimize any specific impacts through operational planning and cutblock design. No specific concerns have come to my attention to indicate that this is not a workable strategy, and again the benefits of partial cutting serve to minimize the risk to maintenance of watershed values. I am therefore

satisfied that water supply concerns can be addressed in this manner and that no adjustment is required on this account in this determination.

- riparian habitat

Riparian habitats occur along streams and around lakes and wetlands. The Forest Practices Code requires the establishment of riparian reserve zones (RRZs) that exclude timber harvesting, and riparian management zones (RMZs) that restrict timber harvesting in order to protect riparian and aquatic habitats. For each stream, lake or wetland, the RRZ and RMZ make up the entire riparian management area. Stream classes are described in the *Riparian Management Area Guidebook* and are determined based on presence of fish, occurrence in a community watershed and average channel width criteria. The stream class is used to estimate the area required to be retained in the RRZ and the area or volume to be retained in the RMZ. Similar criteria are used to classify lakes and wetlands and estimate reserve zone and management zone retention.

The licensee has indicated in Management Plan No. 8 that the 1995 stream inventory for TFL 14 was updated on the basis of aerial photography, and slope and field information by the consultant who prepared the original inventory. Classified streams were subsequently mapped and the riparian reserve and management zones were determined using GIS. In deriving the timber harvesting land base for this analysis a total of 1482 hectares of riparian reserve areas were excluded. Practices in riparian management areas—totalling about 6000 hectares—were modelled by applying forest cover constraints that reflected the average volume retention levels in each landscape unit. BCFS district and MELP staff have reviewed the information and assumptions for riparian areas and support the methodology and deductions applied in the analysis to account for RRZs and RMZs.

I have reviewed the information regarding riparian areas and I am satisfied that this factor has been modelled appropriately and would like to commend the licensee on the thoroughness of its stream classification. I have made no further adjustments on this account.

- biodiversity

Biodiversity is defined as the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at both the landscape and stand levels.

1) landscape-level biodiversity

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across ecosystems and landscapes. A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species that are dependent on or are strongly associated with old-growth forests.

Although some general forest management practices can broadly accommodate the needs of most ecosystems, more often a variety of practices is needed to represent the different natural disturbance patterns under which ecosystems have evolved.

The *Biodiversity Guidebook,* the *Landscape Unit Planning Guide* and *Higher Level Plans: Policy and Procedures* (Policies and Procedures) all provide policy and guidance on management for landscape-level biodiversity. The *Landscape Unit Planning Guide* provides guidance on which components of the full range of recommendations included in the *Biodiversity Guidebook* should be implemented to achieve a balance of forest management objectives. The *Landscape Unit Planning Guide* contains forest cover requirements for old seral forest that are to be applied at the biogeoclimatic variant level within each landscape unit. The requirements are stated as a minimum percentage of the productive forest to be retained in stands above a specified age that varies by ecosystem type. The guide also allows the old-seral requirement to be phased in over time in landscape units subject to a low biodiversity emphasis option (BEO).

The 1996 Higher Level Plans: Policy and Procedures guide provides further policy guidance. It outlines three BEOs—low, intermediate and high—that may be employed when establishing biodiversity management objectives for a landscape unit. To achieve a balance between biodiversity and timber supply objectives, this guide recommends the application of a mix of BEOs in each subregional planning area. The proportions of a planning area subject to lower and intermediate biodiversity emphasis should range from 30 to 55 percent, with the average at approximately 45 percent of the area subject to lower, 45 percent to intermediate, and 10 percent to a higher BEO (45-45-10).

The landscape units pertinent to TFL 14 have been assigned low and intermediate BEOs by the Kootenay-Boundary HLP Order. Seral stage distributions within each landscape unit were defined based on NDT and biogeoclimatic variant.

At the time the analysis was prepared, BEOs had not been formally designated for landscape units on TFL 14; therefore, the licensee used the provincial distribution of 45-45-10 in the base case. The licensee provided three analyses that examined the sensitivity of the base case to the following: the application of the landscape unit specific BEOs described in the Kootenay-Boundary HLP Order; application for lodgepole pine of a lower old seral age requirement than described by provincial policy (140 years instead of 250 years); and landscape units without seral stage requirements (i.e., no BEOs).

The application of the BEOs described by the HLP Order had no effect on the short- and mid-term timber supply, while the long-term timber supply decreased by less than 2000 cubic metres per year. Reducing the old seral age requirement for lodgepole pine, or removing the biodiversity emphasis option requirements entirely, extended the short-term harvest level for an additional 5 years at the current AAC, but had no impact on the mid- and long-term timber supply.

On August 14, 2000 the licensee submitted an addendum to the timber supply analysis that included a *Revised Current Management Option,* in which ungulate winter range constraints and some of the effects of blocking were corrected (see Alternative harvest flows). The addendum included sensitivity analysis, which examined the sensitivity of the timber supply to using the BEOs described in the Kootenay-Boundary HLP Order,

using the *Revised Current Management Option* as a basis for comparison. In this analysis, the mid-term timber supply was decreased by about 7 000 cubic metres per year.

BCFS district and MELP staff indicated that harvesting in old-growth management areas (OGMAs) is not anticipated once the landscape unit planning process has been completed and OGMAs have been formally established. Until such planning is complete, and OGMAs are established, staff accept that the forest cover requirements modelled in the base case provide for a distribution of old growth consistent with the requirements in the Kootenay Boundary HLP Order (see Kootenay-Boundary Higher Level Plan Order).

In conclusion, with respect to the application of the standard provincial BEO distribution of 45-45-10, instead of the actual BEO distribution now established for the landscape units of the TFL through the HLP Order, I note that the sensitivity analyses indicate that there is no impact to timber supply in the short-term, and only a very small reduction in timber supply in the mid and/or long term. However, as discussed previously in this document (see *general size of the timber harvesting land base* and *minimum harvestable age*) the exaggerated effect of forest cover constraints that resulted from the interaction of the block definitions with the model's block processing makes it difficult to interpret the results of these sensitivity analyses. In any event, BCFS Timber Supply Branch staff have noted that the forest cover requirements modelled in the base case provide for a distribution of old-growth forest very similar to the distribution that results from the application of the BEOs established through the HLP Order.

The licensee provided an alternative approach to achieving landscape level biodiversity objectives entitled the *Ecosystem-based Biodiversity Option.* The intent of this option was to map candidate areas for the management of biodiversity, rather than accounting for them through the application of forest cover requirements. In this option, reserve and recruitment areas were identified using terrestrial ecosystem mapping (TEM) for the potential placement of OGMAs and connectivity corridors. A review of the candidate areas indicated that about 1000 hectares more productive forest were identified than would be required if the recommended seral stage distributions from the *Landscape Unit Planning Guide* had been used.

In the *Ecosystem based Biodiversity Option*, candidate reserve and recruitment areas were excluded from contributing to timber supply, and landscape-level biodiversity forest cover requirements were not applied. When compared to the base case, excluding these areas from contributing to timber supply resulted in a decrease in the merchantable volume at the start of the forecast period of about 1.2 million cubic metres (15 percent) and according to the licensee's analysis, a 5 percent decrease in the timber supply over the forecast period.

BCFS district and MELP staff believe that the reserve and recruitment strategy will provide valuable guidance for the placement of OGMAs and connectivity corridors during the landscape unit planning process. I commend the licensee for its innovative work in this area and encourage the licensee and BCFS district and MELP staff to coordinate the placement of OGMAs with model outputs to minimize the impact on long-term timber supply.

I have reviewed the information regarding landscape-level biodiversity and have concluded that the licensee's *Ecosystem-based Biodiversity Option* most accurately reflects the probable impacts of OGMA and connectivity corridor placement. I will discuss the implications of these analysis results further under Kootenay-Boundary Higher Level Plan Order.

2) stand-level biodiversity considerations (wildlife tree patches)

Stand-level biodiversity is managed by retaining reserves of mature timber, or wildlife tree patches, within cutblocks and in adjacent inoperable and other retained areas to provide structural diversity and wildlife habitat. The *Landscape Unit Planning Guide* outlines procedures and makes recommendations on the proportion of a cutblock that is required in wildlife tree retention.

In the formulation of the base case, existing wildlife tree patches (WTP) were identified from the forest inventory files and were classified as non-contributing to harvest but were still considered to contribute to landscape level biodiversity requirements.

To simulate the requirements of the *Landscape Unit Planning Guide*, the licensee used a GIS-based approach to determine which areas within the timber harvesting land base were more than 250 metres from productive forest areas outside the timber harvesting land base or from stands with veteran layers of trees. The licensee then applied the full requirement outlined in table A3.1 of the guide, which outlines the requirements for wildlife tree retention for areas where landscape units have been designated and landscape level biodiversity objectives have been established, to estimate the additional area required in the timber harvesting land base for wildlife tree retention. This area amounted to 2.7 percent of the timber harvesting land base. To account for this additional area required for WTPs, the licensee applied an average volume reduction of 2.7 percent to the yield tables of all analysis units. BCFS district staff support the method used in the analysis.

I am satisfied that the assumptions used in the base case for stand level biodiversity are appropriate for use in this determination.

- wildlife habitat

TFL 14 is known to support large mammal species including mule deer, moose, elk, grizzly bear, as well as a variety of smaller mammals, numerous birds, fish and invertebrate species. In the analysis, the habitat requirements of most wildlife species were assumed to be addressed through the seral stage distribution and management practices described above under *landscape-level biodiversity.*

1) identified wildlife

Wildlife potentially occurring within or adjacent to TFL 14 include numerous *identified wildlife* species. These include northern goshawk, Lewis's woodpecker, bull trout, fisher, grizzly bear and mountain goat. *Identified wildlife* refers to species at risk (red- and blue-listed) as well as regionally significant species which are potentially affected by forest management activities and which have not been adequately accounted for through

existing management strategies. While the biodiversity and riparian provisions of the Forest Practices Code are intended to provide for the needs of most wildlife species, some species that are considered to be "at risk" require special management practices. The Province's *Identified Wildlife Management Strategy* (IWMS)—released in February 1999—provides mechanisms for managing critical habitat for identified wildlife species including Wildlife Habitat Areas (WHAs), General Wildlife Measures (GWMs) and higher level plan recommendations.

For this determination, no information is available to specify the exact location or precise amount of WHAs that will be required within the timber harvesting land base to implement the IWMS. However, I note that government has limited the impact of management for identified wildlife in the short term to a maximum of one percent of the harvest level for the province. Given the Province's commitment to implementing the IWMS, and given the policy decisions and projected one-percent impact—and noting the expected occurrence of identified wildlife within TFL 14—I find it necessary and appropriate to account for an expected but not fully quantified impact on the timber supply. I have therefore concluded that timber supply may be up to one percent lower than projected in the base case and have considered this below in 'Reasons for decision'.

As the Province implements its strategy for the management of species at risk, I expect the specific implications to be reflected in future timber supply analyses for TFL 14 and these will be taken into account in future AAC determinations.

2) ungulate winter range and grizzly bear

In the analysis, forest cover requirements were developed based on the requirements in the KBLUP-IS for the three ungulate species present on the TFL. The forest cover constraints for elk, which specify that a minimum of 30 percent of the productive forest be at least 101 years old, were applied to a total of 4943 hectares—4350 hectares of timber harvesting land base—in the Columbia Bench landscape unit. Mule deer forest cover requirements, which specify that a minimum of 25 percent of the productive forest be at least 101 years old, were applied to a total of 1377 hectares of productive forest—including 508 hectares of timber harvesting land base. Moose forest cover requirements, which specify that a minimum of 40 percent of the productive forest be at least 81 years of age, were applied to a total of 8206 hectares of productive forest land—including 7225 hectares of timber harvesting land base. The licensee based interpretations of wildlife habitat capability upon a review of TEM, habitat use studies and local knowledge.

BCFS district and MELP staff have reviewed the assumptions regarding ungulate habitat applied in the analysis in comparison to the requirements outlined in the KBLUP-IS. Staff indicate that the majority of the analysis assumptions are consistent with the KBLUP-IS and reflective of current and generally accepted practice. However, with respect to the assumptions for moose, they have indicated that given the deep snow pack conditions in the moose winter range, minimum stand age in these areas should have been 100 years rather than the 81 years used in the analysis.

Staff have also indicated that grizzly bear habitat management will be based upon the requirements in the Kootenay-Boundary HLP Order rather than the IWMS. The most restrictive of these guidelines relate to the protection of mature and/or old forests adjacent to avalanche paths. Review of the licensee's *Ecosystem-based biodiversity emphasis option* (see *landscape-level biodiversity*), indicates that some of the avalanche slides will be protected for grizzly bears under this strategy. However, according to MELP staff, some additional areas that may be needed for grizzly bears were not included in this option. No specific requirements for grizzly bears were modelled in the base case.

I have reviewed the information and findings of staff concerning ungulate and grizzly bear habitat, and have reasoned as follows. The licensee's *Ecosystem-based biodiversity option* incorporates the requirements for elk and mule deer, most of the requirements for moose, and portions of the grizzly bear habitat objectives. However, I believe that an increase in the retention age of stands for moose winter range and the potential shortfall in mature and old stands along avalanche tracks required for grizzly habitat will exert a small downward pressure on timber supply in the mid to long term, over and above the effects described below under Kootenay-Boundary Higher Level Plan Order, and I have accounted for this in my determination, as discussed in 'Reasons for decision'.

(v) any other information that in the chief forester's opinion, relates to the capability of the area to produce timber,

Kootenay-Boundary Higher Level Plan Order

Strategic plans establish the broader context for operational plans by providing objectives for managing forest resources in a given area. There are several types of planning processes that are described as strategic in relation to operational planning processes. Distinction must be made between legally binding higher level plans as defined by the Forest Practices Code, and policy-based strategic regional or subregional plans (land and resource management plans). Portions of plans arising from strategic planning processes may be declared as higher level plans under the Forest Practices Code. A higher level plan under the Forest Practices Code establishes government's binding social, economic and environmental objectives, thereby setting the resource management context for developing subsequent operational plans.

Government announced the Kootenay-Boundary Land Use Plan (KBLUP) in March 1995, and the detailed implementation strategy —the Kootenay-Boundary Land Use Plan-Implementation Strategy (KBLUP-IS)—in 1997. The subsequent Kootenay-Boundary Higher Level Plan Order, which contains critical provisions of the KBLUP-IS, is binding on all operational plans approved after May 31, 2001. It is not all inclusive, and there are some provisions that arose from implementation of the KBLUP that are not included in the Higher Level Plan Order, either because they are already satisfactorily addressed by the Forest Practices Code (which was implemented after the 1995 KBLUP), because they do not affect operational or strategic planning and will be handled through other means, or because the provisions would result in unacceptable socio-economic impacts.

I am aware that current practice on TFL 14 is conducted in accordance with the Kootenay-Boundary HLP Order, and that some of the recommendations of the KBLUP-

IS, which are now reflected in the Kootenay-Boundary HLP Order, were used in the development of the assumptions for this timber supply analysis. The licensee's *Ecosystem-based Biodiversity Option* (see *landscape level biodiversity*) provided an additional harvest forecast that incorporated many of the aspects of the KBLUP-IS including connectivity corridors, biodiversity conservation based on terrestrial ecosystem mapping, most of the habitat requirements for moose, and some of the requirements for retention of mature and old stands along avalanche tracks for grizzly habitat.

In this option, a 10 percent reduction in the timber harvesting land base due to the reserve and recruitment of candidate areas for the management of biodiversity, resulted in a 5 percent decrease in the mid- to long-term timber supply. As I noted under *landscape level biodiversity*, in this option about 1000 hectares more productive forest were reserved than would be required if the recommended seral stage distributions from the *Landscape Unit Planning Guide* had been used. I therefore consider this 5 percent decrease in the mid- to long-term timber supply to represent the upper limit of any potential impacts due to implementation of the Kootenay-Boundary HLP Order. BCFS district and MELP staff have reviewed this option and believe that it will provide valuable insight during landscape unit planning.

I believe that the period following the establishment of the Kootenay-Boundary HLP Order will provide greater clarity around the management for specific resource values on TFL 14. For the purposes of this determination, I am prepared to accept that the base case has overestimated the mid- to long-term timber supply to an extent that will not be fully quantifiable (up to 5 percent) until landscape unit planning is complete, and I have accounted for this in my determination, as discussed in 'Reasons for decision'. I encourage BCFS district and MELP staff to work with the licensee to determine if some coordination between the model outputs for this analysis and OGMA placement might minimize the timber supply impact. I am confident that impacts of the Kootenay-Boundary HLP Order will be better understood when the next AAC determination is made.

- twenty-year plan

The purpose of the twenty-year plan is to illustrate if the harvest volume projected in the base case over the next 20 years can be appropriately configured in specific areas on the landscape. For this analysis the licensee prepared two different twenty-year plans. One plan was prepared by Tembec; the other plan was generated by the spatially-explicit model, CASH 6, with an emphasis placed on harvesting the blocks identified in the plan prepared by Tembec.

The harvest level used in the twenty-year plan prepared by Tembec was based upon the harvest level projected in the base case and covered the period between 2000 and 2019. The initial 5-year period of the Tembec plan included the blocks identified in the current forest development plan. BCFS district staff have reviewed the twenty-year plan prepared by Tembec and indicate that it is feasible.

For the twenty-year plan that was generated by the model, the assumptions for green-up, patch adjacency, and regeneration differed slightly from the assumptions used in the base

case (*Current Management Option*). I also note that the biodiversity emphasis options assigned in the Kootenay-Boundary HLP Order for each landscape unit were incorporated in this analysis.

The results of the CASH 6 spatial feasibility analysis indicated that 25 to 33 percent of the blocks identified in the Tembec twenty-year plan were not available for harvest and these blocks were replaced by other blocks in the analysis to achieve the harvest request. Review of the blocks identified in Tembec twenty-year plan indicated that many contained small patches of NSR and this made the entire block unavailable for harvesting in the model-generated plan. When the licensee and the consultant adjusted stand ages for these blocks, they found a significant improvement in the correlation between the two plans.

I have reviewed the twenty-year plans and I have discussed with BCFS staff the issue of correlation between the Tembec twenty-year plan and the model-generated twenty-year plan. I am satisfied that for this determination, the short-term timber supply projected in the base case can be attained on the landscape.

(b) the short and long term implications to the Province of alternative rates of timber harvesting from the area;

Alternative harvest flows

The nature of the transition from harvesting old growth forests to harvesting second growth forests is a major consideration in determining AACs in many parts of the province. In the short-term, the presence of large timber volumes in older forests often permits harvesting above long-term levels without jeopardizing future timber supply. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and mid-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain sufficiently stable so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

In addition to the base case harvest forecast, the licensee presented three alternative harvest flow projections. In one alternative, the licensee increased the initial harvest level represented in the base case (164 000 cubic metres per year) by approximately 20 percent. In this alternative, a harvest level of 200 000 cubic metres per year was maintained for 5 years before declining approximately 9 percent per decade to a mid-term harvest level of 123 000 cubic metres per year. This mid-term harvest level was maintained for 4 decades before increasing to the long-term harvest level of 160 000 cubic metres per year—2000 cubic metres per year lower than the long-term harvest level attained in the base case.

In a second alternative, the licensee's model maintained the current AAC of 164 000 cubic metres for 3 decades before declining approximately 9 percent per decade

to a mid-term harvest level of 135 000 cubic metres per year. The mid-term harvest level was maintained for 5 decades before increasing to the same long-term harvest level attained in the base case—162 000 cubic metres per year.

A third alternative projected a non-declining harvest forecast of 150 000 cubic metres per year for the entire forecast period.

On August 14, 2000 the licensee submitted an addendum to the timber supply analysis report that included a harvest forecast entitled *Revised Current Management Option* that corrected the ungulate winter range constraints and some of the effects of blocking. The licensee indicated that the *Revised Current Management Option* more closely reflects current management on the TFL than the *Current Management Option*.

In the *Revised Current Management Option* an initial harvest level of 155 000 cubic metres per year was maintained for 3 decades before decreasing to the mid-term harvest level of 150 000 cubic metres per year. The mid-term harvest level was maintained for 7 decades before increasing to the same long-term harvest level attained in the base case—162 000 cubic metres per year.

In the addendum the licensee also provided an alternative harvest flow to the *Revised Current Management Option*. In this alternative, the licensee increased the initial harvest level to 165 000 cubic metres per year. This harvest level was maintained for 1 decade before decreasing to the mid-term harvest level of 150 000 cubic metres. The mid-term harvest level was maintained for 8 decades before increasing to the long-term harvest level of 164 000 cubic metres per year.

I have reviewed the alternative forecasts presented by the licensee and I have concluded that the dynamics of timber supply in this unit demonstrate significant flexibility in the short term. To the extent that uncertainty in the assumptions used in the analysis introduce risk to the base case timber supply forecast, I have been mindful of this flexibility in making my determination and have considered this in my 'Reasons for decision'.

Community dependence

The employment base for TFL 14, and the mills it supplies, includes people living in the communities of Cranbrook, Kimberley, Elko, Fernie, Canal Flats, Parson, and numerous communities in the Columbia Valley.

The licensee provided employment statistics for TFL 14 in Management Plan No. 8. These figures indicated a total employment attributable to the TFL of 208.7 person-years. The licensee has indicated that it is engaged in a number of initiatives that have or will lead to increased employment throughout all of its operations, including TFL 14.

I have reviewed the information and am mindful that the volume harvested from TFL 14 provides a significant contribution to the employment in the local area.

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities;

Timber processing facilities

The licensee operates the following timber processing facilities: two sawmills, located at Canal Flats and Elko; three planer mills, located at Cranbrook, Canal Flats and Elko; and a pulp mill located at Skookumchuck.

Almost all of the 183 808 cubic metres of wood harvested in 1999 from TFL 14 was utilized by the Canal Flats sawmill. The volume harvested from the TFL represents approximately 28 percent of the volume requirements of this facility.

I have reviewed the information regarding timber processing facilities and conclude that there is a strong demand for the timber harvested from TFL 14.

(d) the economic and social objectives of the Crown, as expressed by the minister, for the area, for the general region and for the Province; and

Minister's letter and memorandum

The Minister has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester—a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum dated February 26, 1996, (attached as Appendix 4). These economic and social objectives are an important consideration in my determination of an AAC for TFL 14.

The Minister's letter and memorandum include objectives for forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked the chief forester to consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomic areas. The latter would likely require the use of alternative harvesting systems, and to encourage this the Minister suggested consideration of partitioned AACs. In this respect I note that in TFL 14 the licensee has been successfully applying alternative harvesting systems to significant areas for several years. The licensee continues to show considerable innovation and initiative in applying a range of silvicultural systems, including selection harvesting, seed tree retention and shelterwood. Approximately 10 percent of the timber harvesting land base of TFL 14 is harvested using non-clearcut methods. The licensee has also successfully used unconventional harvesting technology such as helicopter and cable yarding systems in areas previously considered to be uneconomic to harvest. Considering this favourable performance record, I see no need at this time to establish a partition in the AAC.

The Minister's memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. I have discussed this above under *visually sensitive areas*, where I noted that for TFL 14, the visually sensitive areas are being managed for the most part using partial-harvesting systems. This allows harvesting to occur with little or no impact on visual resources.

I have considered the contents of the letter and memorandum in my determination of an AAC for TFL 14. I note that commercial thinning is not currently part of the management regime on TFL 14, and that the licensee has not included any provisions for commercial thinning in the current management plan. In addition, I have considered the applicability of a partition on the TFL and am satisfied that there are no concerns that would warrant instituting a partitioned component in the AAC for this determination.

- local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives.

The licensee for TFL 14 prepared a public consultation strategy that was reviewed and approved by the BCFS Nelson Forest Region in 1998. In accordance with this strategy the *Statement of Management Objectives, Options and Procedures* and draft Management Plan, which included the timber supply analysis report, were both advertised for public review in the local newspapers in Cranbrook, Invermere, and Golden. Copies of the documents were made available for review and comment for a 30-day period at the Golden Public library and at Crestbrook Forest Industries (now Tembec) Parsons office. Four responses regarding the draft Management Plan were received from the public and the licensee responded to the satisfaction of BCFS staff.

In reviewing this information, I note that the licensee has carried out its public involvement obligations satisfactorily and I do not have any concerns for the purposes of this determination.

8(3)(c) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Mountain pine beetle

In the rationale for the previous AAC determination, a concern was expressed regarding mountain pine beetle infestations in the visually sensitive areas on the Columbia Bench. Specifically, it was noted that partial cutting in these areas might increase the vulnerability of the forest to infestations due to longer rotations. According to the 1999 annual report for TFL 14, the licensee has an aggressive pest management strategy that has led to the identification and treatment of approximately 1000 mountain pine beetle infestation sites.

Two salvage logging permits for a total volume of 5 407 cubic metres were granted that allowed for the removal of insect damaged timber, while a further 26 cutblocks were prioritized for harvesting due to mountain pine beetle activity. The licensee is engaged in ongoing monitoring of pests on the TFL in conjunction with BCFS forest health staff, researchers from the University of Calgary, and various contractors.

While I note the licensee's commitment to pest management, partial cutting will continue to require careful monitoring and review since addressing forest health concerns may not be compatible with maintaining visual integrity.

Non recoverable losses

Non-recoverable losses are timber volumes destroyed or damaged by agents such as fire, wind or disease that are not recovered through salvage operations. Estimates for unsalvaged losses account for epidemic (abnormal) infestations and for factors that result in losses that are not recovered through salvage harvest programs and are not recognized in yield estimates. Timber losses due to insects and diseases that normally affect individual trees in forest stands (endemic losses) are accounted for in inventory sampling for existing timber yield estimation or through other methods.

The major sources of non-recoverable losses (NRLs) on TFL 14 are insects, fire, disease and windthrow. In the base case, non-recoverable losses were estimated to be 8631 cubic metres per year. Specific values for NRLs are not available for the TFL; therefore, TFL estimates were prorated using the values for the adjacent Invermere TSA. TFL 14 losses to disease were assumed to be smaller than those assumed for the Invermere TSA, because the incidence of armillaria root-rot is lower on the TFL than on the Invermere TSA. Review of the licensee's annual report (1999) indicates that the licensee is taking appropriate actions to reduce losses to armillaria root-rot in accordance with BCFS regional guidelines.

BCFS district staff have indicated that they have been advised by Forest Practices Branch forest health staff that allowances for disease are included in existing stand volume estimates, and therefore there is no need to provide for additional accounting for armillaria in the estimates for unsalvaged losses. Furthermore, district staff have informed me that the licensee is planting sites at risk for plantation pests at higher densities to offset losses to mortality. As a consequence, the provisions for non-recoverable losses as a result of disease incorporated into the base case analysis has probably been overestimated by 2520 cubic metres per year.

I have reviewed the information regarding non-recoverable losses, and am satisfied that the assumptions regarding losses from insects, fire, disease and windthrow applied in the analysis were appropriate. With respect to the assumptions regarding disease losses, I accept the district assessment that it has been overestimated. The base case projection has therefore been underestimated by about 2500 cubic metres per year, and I will discuss this further below.

Reasons for Decision

In reaching my decision on an AAC for TFL 14, I have considered all of the factors presented above and have reasoned as follows:

For the reasons stated in the "Timber supply analysis", and from reviewing the considerations as recorded above, I accept the licensee's base case as an adequate basis from which to assess timber supply for the purpose of this AAC determination.

In the base case, the current AAC of 164 000 cubic metres was maintained for the first five years. Then over the subsequent 15 years, the harvest level decreased in five percent steps after each five-year period to 134 000 cubic metres per year. The projected harvest level then increased to 150 000 cubic metres per year for decades four through ten, before increasing to the long-term harvest level of 162 000 cubic metres per year.

As discussed under "Alternative harvest flows", the licensee submitted its *Revised Current Management Option*. The licensee indicated that this option more closely reflects current management on the TFL and represents its harvest flow preference for this management unit. In this option, an initial harvest level of 155 000 cubic metres per year was maintained for 3 decades before decreasing to the mid-term harvest level of 150 000 cubic metres per year. The mid-term harvest level was maintained for 7 decades before increasing to the same long-term harvest level attained in the base case—162 000 cubic metres per year.

In Management Plan No. 8 the licensee proposed an AAC of 155 000 cubic metres per year. This level is consistent with the licensee's stated objective of ensuring relatively stable timber supply over the short and mid terms.

My considerations have identified factors which indicate that the actual timber supply in the TFL may be either greater or less than that projected in the base case.

Some of these factors can be quantified and their impacts assessed with some reliability. Others influence timber supply by adding an element of risk or uncertainty to the decision but cannot be reliably quantified at this time. These must be accounted for in the determination in a more general way.

For this determination, there are three factors that have been identified that indicate that the timber supply in the base case has probably been overestimated by a quantifiable amount, as follows:

- *estimates for roads, trails and landings*: For this analysis, no adjustment was made to account for existing and future in-block trails and landings, and I conclude that regenerating stand yields were overestimated by approximately 2 percent in the base case and that this will affect the mid- to long-term timber supply.
- *age representation:* The approach used in the model in assigning ages to stands within a 10-year age class leads me to conclude that short- to mid-term timber supply may be overestimated by up to two percent.
- *identified wildlife:* To account for the impact of implementing the Identified Wildlife Management Strategy I accept an overestimation of up to one percent of the timber supply throughout the forecast horizon.

For this determination, there are two factors that have been identified that indicate that the timber supply in the base case has probably been overestimated by an unquantified amount, as follows:

- *Kootenay-Boundary Higher Level Plan Order*: On the basis of the licensee's *Ecosystem-based Biodiversity Emphasis Option*, which is generally viewed as incorporating many of the aspects of the HLP order, I accept that the base case timber supply has been overestimated in the mid to long term by a currently unquantifiable amount. Based upon the information presented to me I do not expect this impact to exceed 5 percent.
- *ungulate winter range and grizzly bear*: I conclude that an increase in the retention age of stands for moose winter range and the potential shortfall in mature and old stands along avalanche tracks required for grizzly habitat will exert a small downward pressure on timber supply in the mid to long term, over and above the effects described above under 'Kootenay-Boundary Higher Level Plan Order".

For this determination, there are three factors that have been identified that indicate that the timber supply in the base case has probably been underestimated by a quantifiable amount, as follows:

- *volume estimates for partially harvested stands*: I note that the intended advanced regeneration age of 20 years was not implemented for stands identified for partial harvesting in the analysis. I conclude that on this account the mid- to long-term timber supply is underestimated by less than 2 percent.
- *Tree improvement*: I conclude that as the base case did not account for the use of genetically improved lodgepole pine seedlings, timber supply has been underestimated by about 2 percent in the long term.
- *Non-recoverable losses*: Estimates for non-recoverable losses applied in the base case accounted for pests that are already accounted for in yield estimates and management practices on TFL 14. I therefore conclude that the base case timber supply was underestimated by 2520 cubic metres per year.

For this determination, there are two factors that have been identified that indicate that the timber supply in the base case has probably been underestimated by an unquantified amount, as follows:

- *spatial cutblock and patch aggregation*: I conclude that the approach used in the analysis in block definition in conjunction with block processing overly constrained the availability of blocks for harvesting, and this results in an underestimation of available timber supply of up to 13 percent in the short and mid term.
- *general size of the timber harvesting land base*: I conclude that the approach used in defining harvest blocks in the modelling resulted in about 10 percent of the timber harvesting land base being reserved from harvesting and this results in an overly conservative estimate of the mid- to long-term timber supply.

In reaching my determination I have considered the above factors and have evaluated them on the basis of which portion of the forecast period they affect (the short, mid, or long term).

Those factors that affect the short term include: identified wildlife, age representation, and patch aggregation. I note that the last two of these factors are related to the approach taken in modelling and that they introduce some uncertainty into the estimates of short-term timber supply. However, the alternative forecasts provided by the licensee indicate considerable flexibility in the short term, with reported initial harvest levels of up to 200 000 cubic metres per year. Therefore, on the whole these model-related uncertainties and the minor underestimation due to the lack of accounting for managing identified wildlife are more than accounted for considering the abundant short-term availability of timber as evidenced by the alternative harvest forecasts.

Factors affecting the long term include: roads, trails, and landings, identified wildlife, higher level plan, ungulate winter range, partial harvesting, tree improvement, and the size of the timber harvesting land base. In my consideration of these factors, I noted that some lead to an overestimation and some to an underestimation of the long-term timber supply. Model-related factors again introduce uncertainty into the exact level that will be achievable. However, I have concluded that the long-term harvest level will be less than 210 000 cubic metres per year—the theoretical maximum sustainable level—but most likely higher than the 162 000 cubic metres per year projected in the base case. The extent to which the factors I identified above affect the long-term timber supply is obscured given the uncertainty that has been introduced due to the model-related factors.

Factors affecting the mid term include: roads, trails, and landings; the higher level plan; partial harvesting; ungulate winter range; tree improvement; non-recoverable losses; patch aggregation and the size of the timber harvesting land base. I find that, with the exception of the model-related factors, the factors that introduce uncertainty in the mid term counteract each other with the result that there is no net effect on the mid-term timber supply.

However, I note that generally in the analyses presented by the licensee that the mid-term harvest level decreases to a level below the short-term. The results of these analyses suggest that this level is in the order of 150 000 cubic metres per year and that a reduction to the mid-term level will be required within the next several decades.

In summary, I have concluded that, on balance, the short-term timber supply for TFL 14 is stable. I note that the licensee has proposed a harvest level of 155 000 cubic metres per year, which is 5 percent lower than the current AAC of 164 000 cubic metres per year. Based upon my consideration of the available information, I agree with the licensee that a reduction to a lower mid-term level at some time in the future will be necessary before the long-term harvest level can be achieved.

However, I am mindful of the Minister's letter of July 28, 1994 that stated "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." Therefore while I agree with the licensee that a step down to the mid-term harvest level is a reasonable strategy, I have decided not to reduce the AAC to the extent proposed.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved on TFL 14 by establishing an AAC of 160 000 cubic metres.

This determination is effective March 28, 2001, and will remain in effect until a new AAC is determined, which must take place within five years of the date of this determination.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the five years required by legislation.

Implementation

In the period following this determination and leading to the subsequent determination, I encourage BCFS and licensee staff to undertake the tasks and studies noted below that I have also mentioned in the appropriate sections of this rationale document. I recognize that the ability of staff to undertake these projects is dependent on available staff resource time and funding. However, these projects are important to help reduce the risk and uncertainty associated with key factors that affect timber supply on TFL 14. I recommend the following:

- that licensee staff review the approach used in modelling to ensure that model-related uncertainties are minimized for the next determination;
- that BCFS district staff monitor the licensee's harvesting performance in the class IV terrain and present this information for consideration at the next determination;
- that the licensee continue to monitor and address any forest health concerns in the partial harvesting areas; and
- that BCFS staff resolve the land base discrepancies in the Bugaboo Park area prior to the next determination.

Ken Baker

Ken Baker
Deputy Chief Forester

March 28, 2001

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the Forest Act, Revised Statutes of British Columbia 1996, reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and

(b) different types of timber and terrain in different parts of private land within a tree farm licence area.

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silvicultural treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

(a) encourage maximum productivity of the forest and range resources in British Columbia;

(b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

(c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;

(d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and

(e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994

Appendix 4: Minister of Forests' memo of February 26, 1996

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

Province of
British Columbia

Minister of
Forests

Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
OFFICE OF THE MINISTER

Ministry of Forests

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: **The Crown's Economic And Social Objectives Regarding Visual Resources**

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis.*

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests